INFORMATION TECHNOLOGY: SOFTWARE DEVELOPMENT

POST MORTEM 2009

by Mark Kelly

Written examination

Thursday 12 November 2009

Reading time: 3.00 pm to 3.15 pm (15 minutes)

Writing time: 3:15 pm to 5:15 pm (2 hours)

	Number of questions	*Number of questions to be answered*	*Number of marks*
A	20	20	20
B	5	5	21
C	12	12	49
			Total 90

• Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
• Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

Materials supplied

• Question and answer book of 22 pages with a detachable insert containing a case study for Section C in the centrefold.
• Answer sheet for multiple-choice questions.

Instructions

• Remove the insert containing the case study during reading time.
• Write your student number in the space provided above on this page.
• Check that your name and student number as printed on your answer sheet for multiple-choice •questions are correct, and sign your name in the space provided to verify this.
• All written responses must be in English.

At the end of the examination

• Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

Legend:

Exam questions are in black.
My suggested answers are in blue.
Rambling commentary is in blue italics.
Examiners' comments may be in red.

This year I am introducing a new award: the Happy Dog award, for when I'm happy with the examiners.

I'd do the same for the ITA exam, but I'm afraid they're never likely to earn one.

Jump to SECTION A, SECTION B, CASE STUDY, SECTION C

SECTION A - Multiple-choice questions

Instructions for Section A

Answer all questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is correct or that best answers the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will not be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question

Question 1

A major weakness of a bus topology is

A. if there is a cable break the whole network is likely to fail
B. if a computer fails the whole network is likely to fail.
C. it is more expensive to install than other topologies.
D. it is more difficult to install than other topologies.

Answer is A.

Bus topology is wired like a string of Christmas tree lights: a single blown bulb stops the entire string of lights. Also, bus topology requires coaxial cable: try finding a NIC with a BNC (bayonet) port nowadays!

Question 2

When writing an algorithm, logic errors can occur.
The best way to discover if an algorithm contains logic errors is to

A. check the variable names.
B. read the internal documentation.
C. design and use test data to test the algorithm.
D. convert the algorithm into a program and run it.

Answer is C. It's deskchecking. Running a program will certainly highlight syntax errors.

Question 3

The writing of a computer program's code for a new system occurs in which phase of the Systems Development Life Cycle?

A. development phase
B. analysis phase
C. design phase
D. testing phase

Answer is A. Has to be development.

Question 4

A random access file is best described as a file where records

A. have no fixed length.
B. must always be read in order.
C. are kept sorted by a key field.
D. can be accessed by using their record number.

Answer is D. Random files are made of records of fixed length (unlike sequential files). Because their lengths are known, the location of a record can easily be determined by position = (recordnumber-1) * recordlength + 1

Question 5

The best reason for using a naming convention for program elements is that

A. it makes the program run faster.
B. it makes the program look more professional.
C. it makes it easier for a user to use the program.

D. it makes the program code easier to read and understand.

Answer is D. The other options are silly. Names disappear during compilation; naming does not affect ease of use; and users don't need to read the source code.

Question 6

A disaster recovery plan documentation would be prepared in which phase of the Systems Development Life Cycle?

A. design phase
B. analysis phase
C. evaluation phase
D. implementation phase

Answer is D. Documentation occurs during implementation (unless you're using an SDLC with a separate documentation phase.) Documentation can't be written until the product is finished (so rule out options A and B) and evaluation occurs way *after* implementation.

Question 7

Project management requires precise scheduling of time throughout the duration of a project. Within this schedule there will be a set of tasks that must be completed on time if the project is to finish on time.
The term a project manager would use for this set of tasks is

A. goal.
B. target.
C. milestone.
D. critical path.

Answer is D. The critical path is the series of tasks from the start to the end of a project that must run on time if the project is to finish on time. In other words, they have no slack.

Question 8

A company has decided to introduce a new system into three stores initially, and then three additional stores each fortnight until all stores are online.
This implementation method is called

A. parallel.
B. phased.
C. direct.
D. pilot.

Answer is B. It sounded a bit like 'pilot' when it said 'three stores initially' but those stores were not used to test the system and learn lessons from so the full rollout would be more successful. Bringing change in in stages is phased implementation.

This is not how I usually use the term 'phased'. I see it as bringing in a single system a piece at a time. e.g. all the computers get stage 1 done, then all of them get stage 2 done, etc.

Question 9

User documentation that details the steps to take in order to operate software is called

A. a Quick Start Guide.
B. an Installation Guide.
C. a Procedures Manual.

D. a Technical Reference Manual.

Answer is C. It's not the others: quick start guides just help you get over the first hurdles using the product; installation guides help you get it into the system and set it up for first operation; technical reference is for extending, modifying, repairing the product.

I've not often heard of a Procedures Manual used in this context. Usually procedures manuals relate to human/office procedures. In IT, it's more often called a user manual.

Question 10

Using encryption software when transmitting data means

A. data intercepted on route is unreadable.
B. data cannot be intercepted on route.
C. data arrives at its destination faster.
D. data is sent in smaller packets.

Answer is A. A pretty simple question. Encryption renders information unreadable to unauthorised people. It does not prevent interception, nor make transmissing faster. Packet size is irrelevant.

Question 11

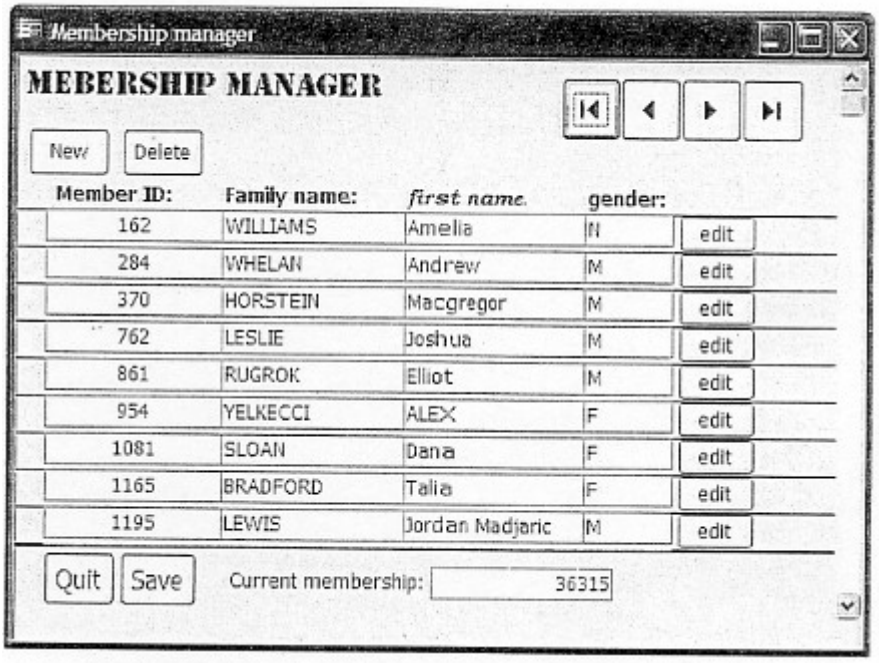
Mary works at a digital photo processing shop. The staff save the files brought in by customers onto the hard disk of a desktop computer before processing them. At the end of each day Mary copies all the photo files that have been processed onto DVDs. She places the DVDs into a fireproof cabinet and deletes all the copied files from the desktop computer's hard disk.
The procedure Mary follows is best described as

A. backing up of files.
B. archiving of files.
C. disposal of files.
D. encryption of files.

Answer is B. Backing up makes a copy of the original, and does not delete the original. Archiving puts the original into offline storage (not immediately accessible without first mounting the storage medium) and deletes the original; disposal is pure deletion with no copies left. Encryption is irrelevant.

The following information relates to Questions 12-16.

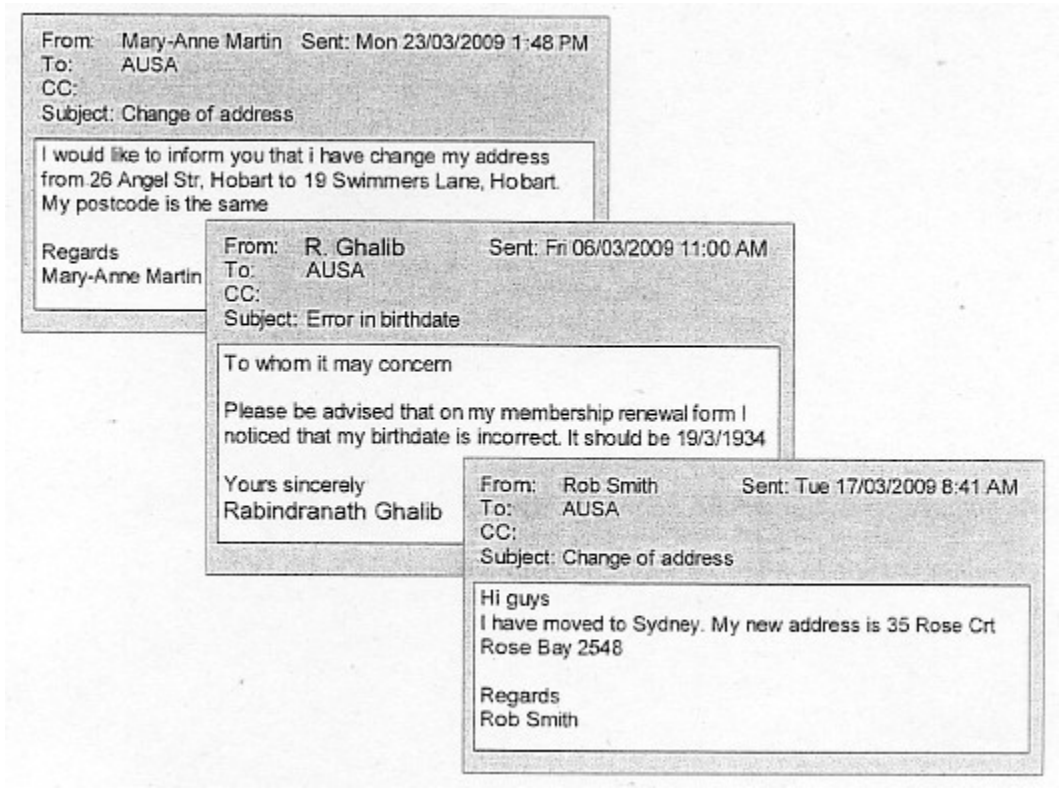
A program is being purpose-designed for the Australian Underwater Surf Association. It will be used to manage a very large amount of data about the association's members.
So that information about members can be added, deleted and edited, a user interface has been created. The following image is a screen shot of the user interface.



The software developer trialled the user interface with users for two weeks. At the end of the two weeks, users reported their experience to the developer.

Question 12

During the trial period users had to edit the details of several hundred members. The information about changes to member details came mostly by email, some examples of which are shown.


From: Mary-Anne Martin Sent: Mon 23/03/2009 1:48 PM
To: AUSA
CC:
Subject: Change of address
I would like to inform you that i have change my address from 26 Angel Str, Hobart to 19 Swimmers Lane, Hobart. My postcode is the same
Regards
Mary-Anne Martin
From: R. Ghalib Sent: Fri 06/03/2009 11:00 AM
To: AUSA
CC:
Subject: Error in birthdate
To whom it may concern
Please be advised that on my membership renewal form I noticed that my birthdate is incorrect. It should be 19/3/1934
Yours sincerely
Rabindranath Ghalib
From: Rob Smith Sent: Tue 17/03/2009 8:41 AM
To: AUSA
CC:
Subject: Change of address
Hi guys
I have moved to Sydney. My new address is 35 Rose Crt Rose Bay 2548
Regards
Rob Smith

Which single feature of the user interface would cause the most annoyance to users?

A. the placement of the buttons
B. the black and white colour scheme
C. the display of records in member ID order
D. the different fonts used in the field headings

Answer is C. Obviously. There's nothing particularly hideous about the button placement; B&W would not add nor detract much from usability; the font changes may be irritating but are otherwise trivial. The sorting of users by membership number makes sense to a database, but is useless as far as a human is concerned.

Question 13

When the 'save' button is clicked the program can take up to one minute to save all the data. The trial users reported that they did not know how long they might have to wait or when they could start editing again.
The best way for the developer to deal with this is to

A. program in a 'meter' which displays how much is left to save and disappears when the save is complete.
B. program a message to be displayed which says 'please wait'.
C. program a message to be displayed after the save is complete which says 'records saved'.
D. do nothing because a minute is not such a long time.

Answer is A. Animated progress meters are important for humans who tend to get nervous when computers seem to have possibly frozen: they tend to anxiously push all sorts of buttons as their panic increases. A reassuring message indicating an ETA at least tells them that things are well. It is better than a static "please wait" which could indeed cover up a software freeze. Telling the person after the event does nothing to help them during the event! D may make sense to the programmer who knows what is 'normal' waiting time, but it does not help a casual user.

Question 14

From the screen shot of the user interface, what evidence is there of a serious error in the data validation process?

A. A help button is missing.
B. The title has been misspelt.
C. A gender has been entered as 'N'.
D. A first name has been entered all in capitals.

Answer is C. While spelling errors may be included in 'validation', it's cosmetic and is not serious. Validation can also check for text case (upper,lower,title etc) but again it's not serious. Invalid data such as an meaningless value, however, can cause serious processing errors or inaccurate information.

Question 15

When the program is running it stores the data shown in the screen shot in an array of records called NAMES. Another array of records called CONTACTS is used to store contact details for each member. When the program's user clicks 'edit' that member's contact details are displayed on the screen.
The field most likely used by the program to link the two arrays is

A. Member ID.
B. Family name.
C. First name.
D. Gender.

Answer is A. It's a unique identifier (like a key field in a database) that cannot possibly occur more than one by chance. People's names and genders can obviously be duplicated.

But key fields and relational databases are in the ITA course, not SD...

Bad examiners are going beyond the study design!

Sorry guys - you're not allowed to do that.

Question 16

Member ID numbers must be between 1 and fifty thousand (50 000). When a new member is added, the program uses the following code to generate a new member ID number.

Member ID = 1 + int(rand( )* 100000/2)

where rand( ) returns a six-digit random number between zero and one, and

int( ) returns the integer part of whatever number is in the brackets.

If a new member is being added and rand( ) returns 0.002222 then Member ID will be set to

A. 2
B. 12
C. 112
D. 1112

Answer is C. The deskcheck is as follows:

> .002222 * 100,000 = 222.2 (remember your order of operations! * and / have the same priority so work them from left to right)
> 222.2 / 2 = 111.1
> int(111.1) = 111
> 1 + 111 = **112**

It's damned good to see the examiners using some realistic functions in their pseudocode.

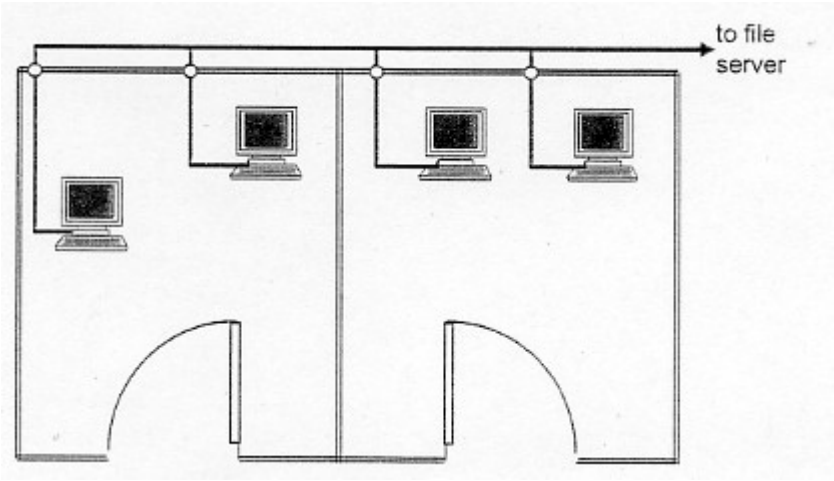
I've previously grumbled about restricting pseudocode to the complexity of a four-function

calculator. As long as the behaviour of the pseudocode functions is made clear, bring 'em on!

And the question was challenging, but not too hard for the average student.

The following information relates to Questions 17 and 18.

ASM is a small business that has a suite of offices on the first floor of a building. It uses an old local area network (LAN) for its business operations. A floor plan of two offices and part of the LAN are shown in the following diagram.



Question 17

When the LAN was first installed its goal was to improve the overall efficiency of the transfer of information within the business.
To achieve this goal there were a number of system objectives, one of which could have been

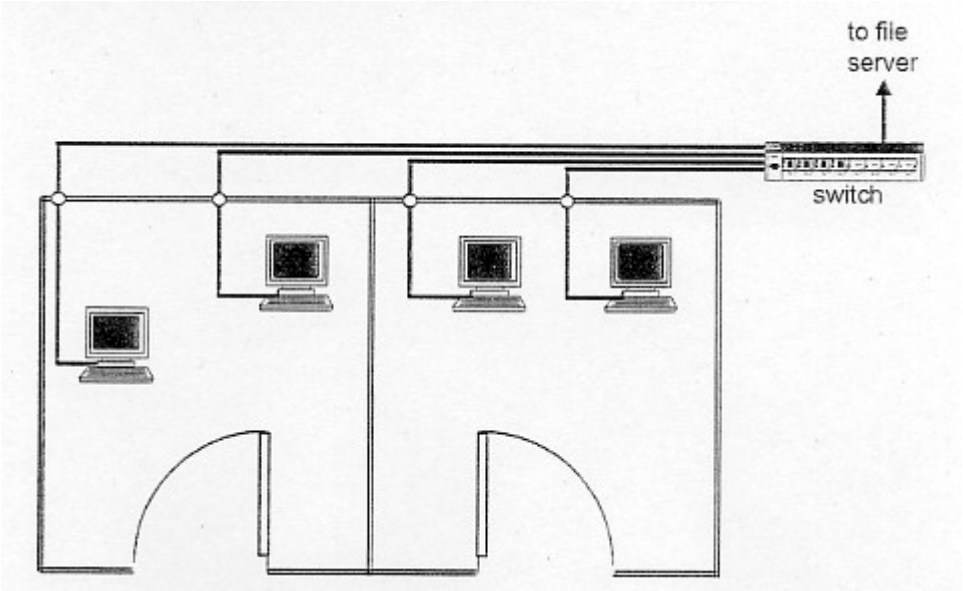
A. to eliminate the need to copy data to and from CD.
B. to improve the clarity of information presented on screen and paper.
C. to minimise errors in data when it was transferred from one computer to another.
D. to maximise the amount of time workers could spend speaking to one another about work issues.

Answer is A. Has to be, because the other options can be ruled out. Keep in mind the key words of the question's stem. They want to improve the **efficiency** of **information transfer**.

Can't be B - Improving clarity of info is not an efficiency measure: it's **effectiveness** (quality of the product, how well it achieves its goals)
Can't be C - while it is about data transfer, accuracy is again an **effectiveness** measure, not efficiency.
Can't be D. While time saving is an efficiency measure, chatting about work is not a **data transfer** issue.

Question 18

ASM's local area network is now outdated and it no longer meets its system goal. It has been suggested that a new network be installed as shown in the following diagram.

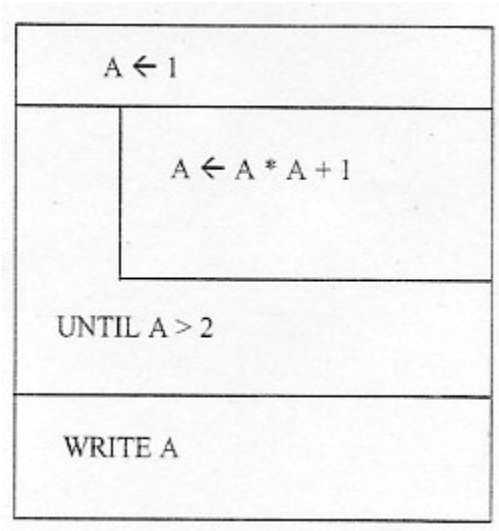


Based on the two network diagrams, the topology of the network is most likely being changed from

A. a star network to a bus network.
B. a star network to a hybrid network.
C. a bus network to a hybrid network.
D. a bus network to a star network.

Answer is D. The original LAN had cables from the workstation all connecting (via T-pieces) to a single (coaxial) cable that led to the server. That's 'bus' and is now superseded. The new LAN has individual (CAT5e or CAT6) UTP cables from workstations going to a switch which has a single cable leading to the server. That's star topology, and it the norm for SOHO (Small Office / Home Office) LANs.

Question 19



The output for the Nassi-Shneiderman diagram above would be

A. 2
B. 3

C. 5
D. 6

Answer is C. Get a scrap piece of paper and do a walkthrough:

A=**1**
A=1*1 + 1 = **2**
2 isn't >2 so loop again...
A=2*2+1 = **5**
5 > 2 so fall through...
Write **5**.

Question 20

A software company has a policy that 50% of all lines in a program must be internal documentation lines. The reason for this is

A. it makes the program easier to use.
B. it makes the program code more efficient.
C. it makes the program output easier to read.
D. it makes the program easier to alter by another programmer.

Answer is D. Internal documentation is ignored during compilation and is never seen by the program's user. It doesn't improve the performance of the code it's in. It doesn't affect the readability of the code. It does help later programmers understand why things were done as they were so they can maintain the code after the original programmers are long gone with all their understanding of the code.

SECTION B - Short answer questions

Instructions for Section B

Answer all questions in the spaces provided.

Question 1

A clothing store Data Base Management System (DBMS) is being updated to include more fields about items on sale. The following field types are available.
Numeric Integer, Numeric Floating Point, String/Text, Boolean, Time/Date Select the most appropriate field type for the fields below.

Field	Field type
Colour	String/Text
Date purchased	Time/Date
Supplier phone no. e.g. (03) 9987 2121	String/Text
Still available?	Boolean

4 marks

Colour and date purchased are clear enough. I like the way the examiners provided a sample phone number to make it clear why number was not acceptable - a number cannot store parentheses, spaces or leading zeroes! And I like the way the examiners expect SD students know Boolean by name and did not append "true/false" to it.

Question 2

Robert owns a small business selling handmade model cars. Recently there has been more interest from overseas customers. He has decided to launch a website to take orders for the sale of his model cars online.
List **three** potential advantages for his business.

- Can reach a global audience > more sales.
- Can include rich multimedia to provide information about his products, like photos, animations, sound > promotes products, informs buyers.
- Can provide a source of after-sales help and support for buyers > builds confidence in buyers > repeat sales.
- Online ordering allows immediate sales and electronic payment > boosts sales.
- Can update his product information instantly > information is always current and reliable.

3 marks

*On the printed exam, each advantage had 3 lines of space for answers - rather a lot for 'listing' things! I'm concerned the amount of space provided might encourage students to describe or explain rather than just **list**.*

Question 3

A school has decided to purchase a new electronic roll-marking software package. The software allows teachers to mark a student absent by scanning a barcode printed next to the absent student's name in the rollbook. This is done by using either a portable computing device that has a built-in barcode reader or by using a barcode reader that can be attached to an existing portable device. The information is then transmitted wirelessly to a central computer which alerts the coordinators of students absent from class. As the school supplied its staff with portable computing devices just last year, the principal wants to purchase only barcode readers which staff can use on their existing devices. Before purchasing the new system the school needs to check the specifications of the existing devices.

From the list below select the **three** features that the existing portable computing devices **must have** for the roll-marking system to work and justify your selection.

A large 8.2" screen
B ability to store and run additional software
C full keyboard
D stylus
E ability to connect to wireless LAN
F ability to connect to Ethernet cable
G ability to connect to external devices (such as GPS sensor and barcode reader)

Feature	Justification (5 lines per cell)
B ability to store and run additional software	The PCD must be able to run the software that runs the attendance software, and the barcode reader's driver.
E ability to connect to wireless LAN	The PCD is supposed to transmit attendance data wirelessly, so obviously it must be able to connect to a WLAN.
G ability to connect to external devices (such as GPS sensor and barcode reader)	If the BCR is to be retrofitted to the PCD, the PCD must be able to connect to it (duh!)

Why not the others?

A large 8.2" screen - a large screen may be easier to read, but is not a "must have"
C full keyboard - not necessary for scanning a barcode.
D stylus - data entry apart from the barcode is not indicated as being necessary.
F ability to connect to Ethernet cable - might be a nice backup, but is not required for wireless connections.

Question 4

A program is needed to process data for stock items. The data is stored in a file on disk. The file could contain up to 500 records. Three typical records are shown in the following table.

Item ID	Item name	Number in stock	Cost ($)
1	CD RW drive	2	23.50
2	4 Gb RAM	6	54.00
3	17" monitor	2	223.00

Juan, a novice programmer, is writing the program. He has chosen a programming language that recognises the following data types: integer, floating-point decimal, text and Boolean. It will also allow the creation of data structures such as arrays and records.
Juan will use a variable named ItemCost to hold the cost of an item. He has decided to make ItemCost an integer.

a. Explain why this is not the most appropriate choice of data type.

Integer can't store the decimal fraction (cents) of the cost.

2 marks

b. State the data type he should have chosen.

Floating point.

1 mark

*Hmmm. **Another** data type question? We just had that in question B1 above.*

Juan knows that for the program to run most efficiently it should read all the relevant data into memory first. He starts by making a large number of variables: ItemCostl, ItemCost2, ItemCost3, and so on. A colleague sees this and tells Juan that an array will be much more efficient. Explain why. [7 lines provided]

Values stored in arrays can be addressed by their index number, which allows the use of loops to traverse or address any number of values rather than by addressing discrete variables by name.

Juan is an idiot. Which company was dumb enough to let him loose on their data?

2 marks

Question 5

A programmer wishes to check that when a new product number is entered, it is valid and within the prescribed limits. If it is invalid then the user needs to know why. The programmer has chosen to validate the data in the following order: Existence test, Numeric test, Range test.

Explain why this order is necessary.

The validation tests are dependent on preceding tests. Later tests are pointless if a preceding test has already failed. If the data does not exist, no following test makes sense; if it's not numeric, a range test is pointless.

3 marks Total 21 marks

END OF SECTION B

CASE STUDY INSERT FOR SECTION C
Please remove from the centre of this book during reading time.

Truss-Tee organisation
Truss-Tee manufactures timber roof trusses and wall frames for housing construction projects (see Figure 1).

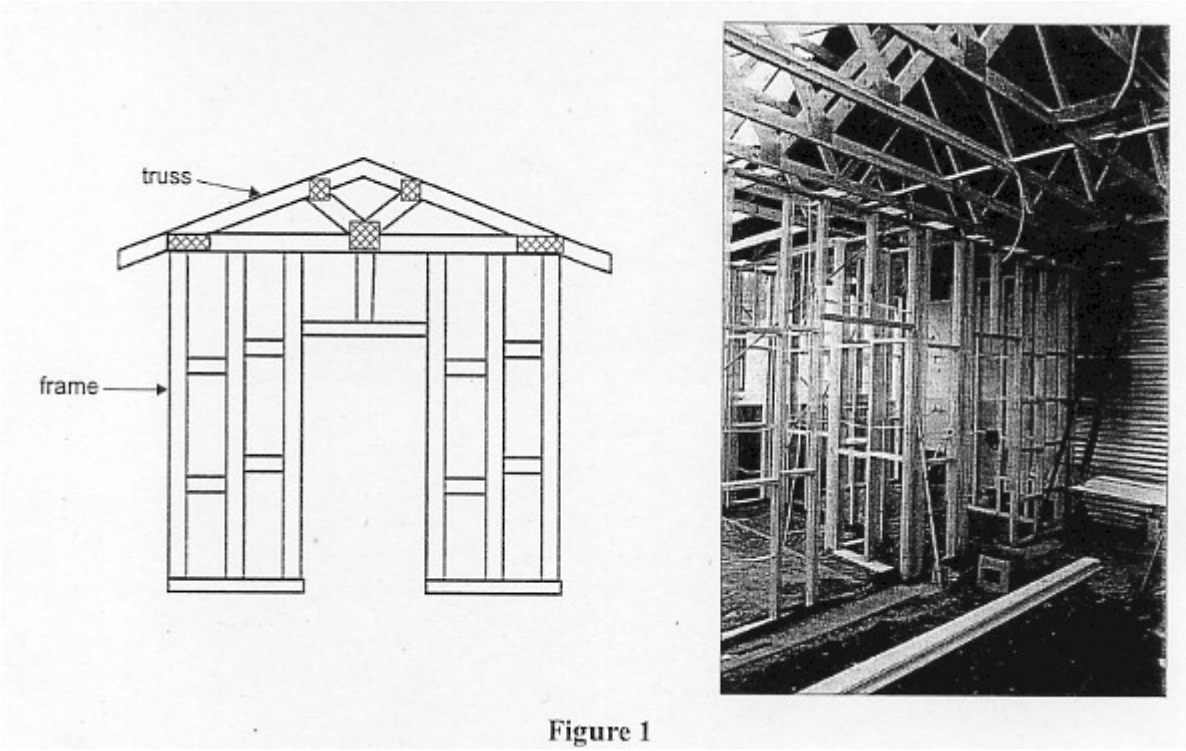


Figure 1

Figure 1

The business is almost 30 years old and has factories in Melbourne, Sydney, Brisbane and Perth.
In 2001 Truss-Tee converted all four factories from manual manufacture to computer-assisted manufacture of
trusses and frames. In each factory identical systems were set up and these are still in operation today.

Current system - hardware and software

The hardware specifications for one factory are shown in the network diagram (see Figure 2).

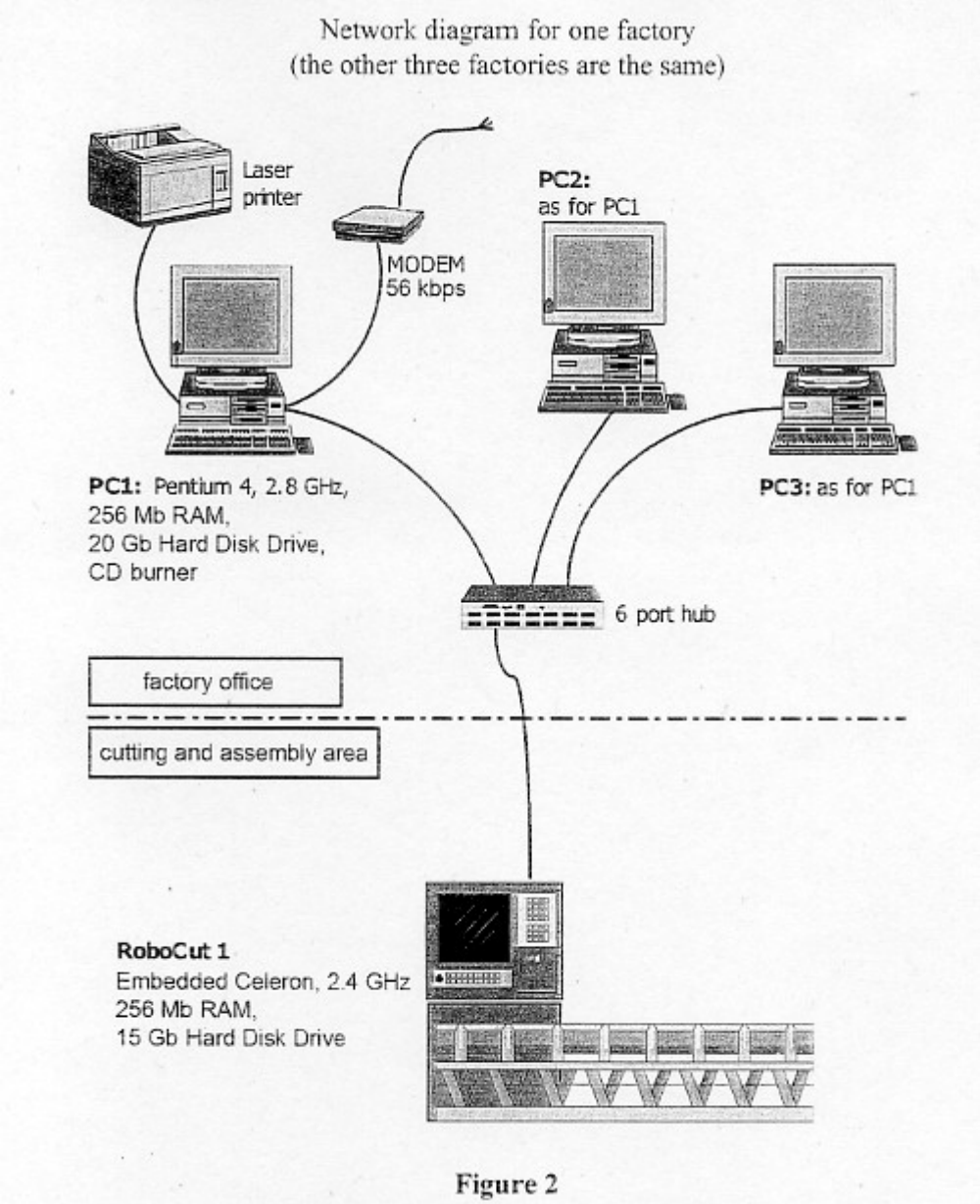

Network diagram for one factory
(the other three factories are the same)
Laser printer
MODEM 56 kbps
PC2: as for PC1
PC1: Pentium 4, 2.8 GHz, 256 Mb RAM, 20 Gb Hard Disk Drive, CD burner
PC3: as for PC1
6 port hub
factory office
cutting and assembly area
RoboCut 1
Embedded Celeron, 2.4 GHz
256 Mb RAM,
15 Gb Hard Disk Drive

Figure 2

RoboCut is a computer-controlled timber cutting system.
The main software component in each factory system is a package called 'MyCut 2020'. Truss-Tee pays an annual licence fee of $8800 to MyCut and this entitles it to receive all package upgrades. The package has two parts.

1. MyCut DESIGNER - installed on PC2 and PC3
2. MyCut DATABASE - only installed on PC 1 PCI also has office-style software installed.

Current system - people and their roles

Each factory has a manager, two designers and eight assemblers.

- **The manager** uses PCI to carry out management tasks, including answering letters and emails, and dealing with the factory's financial matters. The manager also works with clients. This includes starting a new job by entering the client's details into the MyCut DATABASE and later preparing a quote. The quote cannot be prepared until the designers have created the cost data. When they have, the manager obtains the transport

cost from Move It, a trucking company, and combines it with the cost data stored in MyCut DATABASE to produce the quote.

- **The designers** use PC2 and PC3. They enter detailed house plans for each job using MyCut DESIGNER. This is done by drawing the plans on the screen and typing in the dimensions. It is an exacting task requiring a sound knowledge of building practice, so the designers must be qualified carpenters. Depending on the size of the plans it can take three to eight hours to properly enter plans for one house.

  Once the house plans are entered MyCut DESIGNER works out the best design of the trusses and frames and creates the engineering data and cost data needed for the job.
  When a job is ready for the manufacturing stage, one of the designers uses MyCut DESIGNER to produce cutting data and sends this to the RoboCut machine. This takes about five minutes.

- **The assemblers** put the trusses and frames together after RoboCut has cut all the timber required for a job. Once assembly is complete the trusses and frames are transported to the building site.

The data flow and processing described above is shown in the data flow diagram (DFD) below.

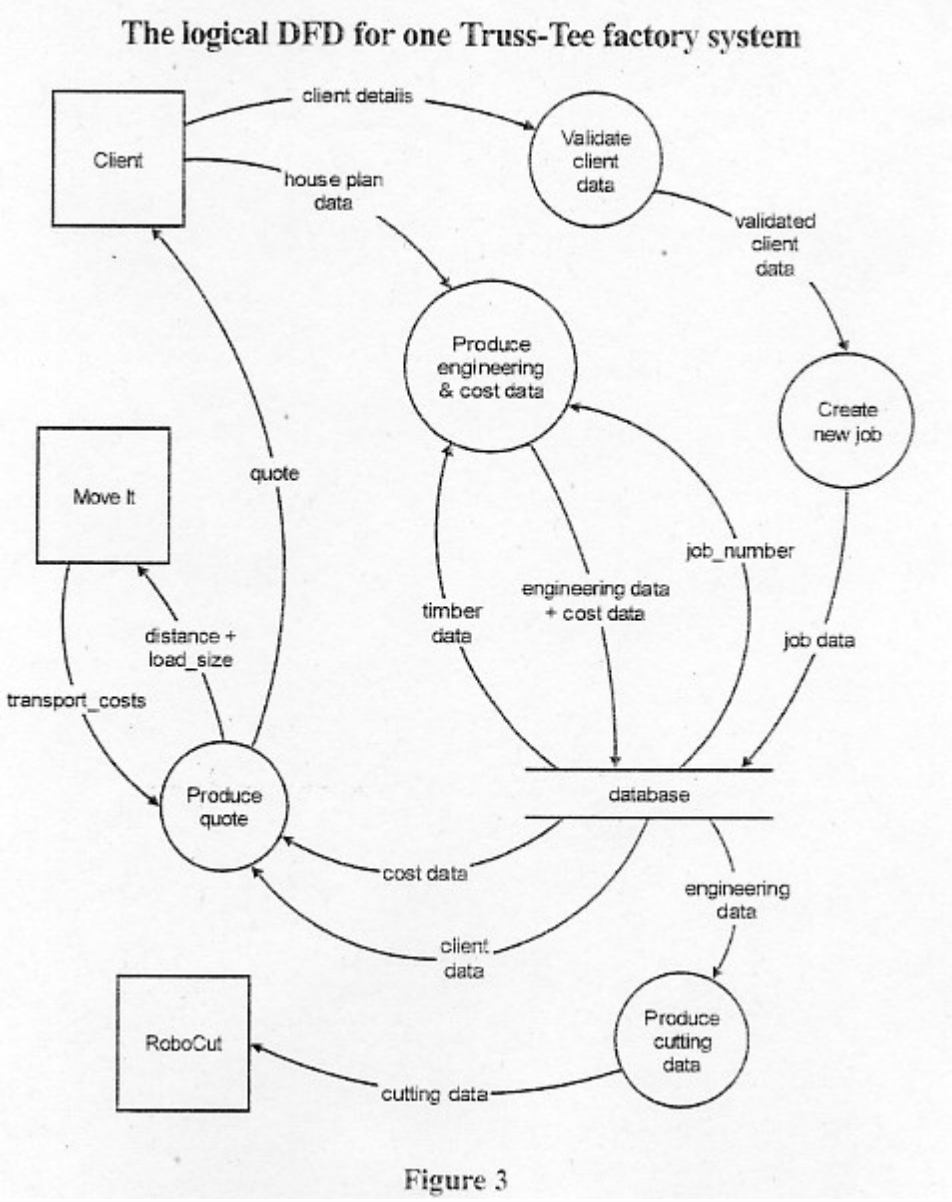


Figure 3

The problem

Last year two designers resigned from Truss-Tee, one from the Sydney factory and one from Melbourne. With an Australia-wide skill shortage, Truss-Tee has not been able to find two qualified carpenters who can do the designer jobs. It has tried to retrain some of the assemblers, but this has not proved successful.

Later this year the other designer in Melbourne is due to retire. Truss-Tee is very concerned about how it can continue to provide high quality service if it cannot obtain skilled carpenters.

Shaun Truscott is the managing director of Truss-Tee. He is aware that each factory has times when its designers have little to do. If their workload could be shared across the four factories, Truss-Tee would not need so many designers.

END OF CASE STUDY INSERT FOR SECTION C

Instructions for Section C

Answer **all** questions in the spaces provided. Remove the case study insert and read **all** the information provided before you answer these questions. Answers must apply to the case study.

Question 1

To help understand the existing system, Rose first tries to identify the main reason for Truss-Tee wanting to change its system.

a. State the main reason for Truss-Tee changing its system.

Qualified designing staff are hard to find, yet they spend considerable time doing nothing. This results in both a shortage of skills and a waste of wages.

1 mark

b. Is this a technical, economic or social factor?

Economic.

1 mark

Question 2

After interviewing the people in the Melbourne factory, Rose has produced a data flow diagram (DFD) of the
factory's current computer-assisted manufacturing system (see Figure 3 in the insert).

a. State the names of the processes that are performed by the program MyCut DESIGNER.

- Produce engineering and cost data
- Produce cutting data

1 mark

b. State which of the PCs are used to perform the 'Validate client data' and 'Create new job' processes.

PC1 - the manager's.

1 mark

c. Explain the purpose of the 'Validate client data' process.

It would make sure all the required client data was present and reasonable (e.g. name exists, postcode is 4 digits) in order to get in touch with them again.

1 mark

Proposed system

Rose has found that the My Cut software is designed only to work on local area networks. To

allow work to be shared between factories she proposes that a large format scanner be placed in each factory. The purpose of the scanner will be to scan house plans. Rose also proposes the following procedure, using the Melbourne factory as an example.

Step 1: When the Melbourne factory receives a set of plans for a house it will scan them and save each sheet as a separate Graphic Interchange Format (GIF) file. On average each set of plans has four separate sheets.

Step 2: If the factory in Melbourne cannot do the design work, but the factory in Perth can, then the Melbourne factory will send the GIF files to Perth via the Internet.

Step 3: When the Perth factory has entered the plans into its MyCut DESIGNER, it will export the engineering data and cost data to a text file. The text file will be sent to the Melbourne factory.

Step 4: The Melbourne factory will import the text file into its MyCut DATABASE. It will then produce the cutting data and proceed as usual.

Rose wants the scanner connected to PC1. She expects each GIF file to be at least 40 Mb in size. She also expects that each factory will scan about 250 sets of plans in a year. Adding the scanner will mean that other changes will have to be made to the system.

Question 3

Apart from speaking to people or contacting MyCut, suggest how Rose might have found out that the software can only operate on a local area network.

She might have tried it and failed. *(Trial and error is a time-honoured experimentation technique!)*

The technical manual might have mentioned the fact.

2 marks

I wondering what the examiners were fishing for here...

Question 4

Perform a suitable calculation and use your result to explain why the existing Internet connection in each factory will no longer be appropriate.

Calculation

Each set of plans averages 4 x 40M = 160M per set. V90 analogue modems can **download** at a theoretical maximum speed of 56Kbps, but (and here's the big but) they can **upload** at a maximum speed of 33.6 Kbps!

At 33.6 Kbps to upload 160MB, the dialup modem would take...

160,000,000 bytes * 8 bits = 1,280,000,000 bits / 33600 bps = 38,095 seconds = 635 minutes = 10.5 hours per set of plans!

*Most students probably said it would take about 8 hours, assuming upload speeds were 56Kbps (and that 56K was actually attainable in real life - which is hardly ever **is**. Never mind - the principle is still right.*

Explanation

It would take an entire extra-long working day to transmit the files for a single set of plans!

3 marks

How many people remembered the asymmetric speeds of V90? I bet no kids knew it...

Question 5

The system software, office software and MyCut DATABASE on PCI currently take up about 16 gigabytes (Gb) of disk space.
a. What is the minimum storage capacity (in gigabytes) that PC1 will need if it also has to store one year of GIF files?

4 sheets * 40MB * 250 times a year = 40,000MB = 40GB (roughly) of GIFs + 16GB of other stuff = 56GB total.

1 mark

Let's not get embroiled in a Gigabytes vs Gibibytes argument! Gibibytes sound like a breakfast cereal.

b. In each factory many flammable materials are stored to keep the machinery working. Rose proposes that in the new system a full backup of PC1's files is made at the end of every day. Suggest a suitable backup medium. Justify your answer.

Portable (USB or eSATA) hard disk drive. They are fast, capacious, reliable, very portable (easy to take offsite for storage), freely available to buy, and extremely cheap per megabyte of storage.

In the past I would have said DAT tape, but the DAT drives are expensive, tapes are expensive and wear out, and HDD would surpass them in every measure nowadays.

2 marks

Gigabytes = GB, not Gb! Gb is gigabits. Bad examiner! ***Bad!***

Question 6

PC1 will need to be upgraded in the new system. Rose has short-listed three computers whose specifications are shown in the table below. Taking into account Rose's plans for PC1, as stated in the proposed system, list the **three** most important specifications she needs to consider in order to choose the most appropriate computer. Explain why each of these **specifications is important for the new PC1**.

Specification	ABC	GP	Bell

Storage	120 Gb Hard Drive	250 Gb Hard Drive	160 Gb Hard Drive
RAM	4 Gb	3 Gb	2 Gb
CPU	4 GHz	3 GHz	4 GHz
DVD/CD drive	DVD +/- RW	DVD +/- RW	DVD +/- RW
Ports	3 USB 2.0	3 USB 2.0	6 USB 2.0
Input	Wireless keyboard/mouse	USB keyboard/mouse	USB keyboard/mouse
Connectivity	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet
Screen	24" LCD 2560 x 1600	27" LCD 1920 x 1200	24" LCD 1920 x 1200

Specification 1

Storage

Explanation

It needs to store at least 56G, with room for expansion later. All of the hard disks above would qualify.

Specification 2

CPU

Explanation

A fast CPU would increase the efficiency of processing large images and performing normal office tasks.

Specification 3

RAM

Explanation

The more RAM (up to the limits the operating system can actually use) the more efficient the computer will process data and be able to multitask.

2 + 2 + 2 = 6 marks

RAM and CPU could easily be swapped. They are about equal in terms of importance. I didn't choose Connectivity because even an average NIC (100Mbps) is far faster than the fastest typical current internet speed (23Mbps). The screen size and number of USB ports is not really important to the case study. The designers would probably care for bigger screens, but not PC1.

Question 7

During her analysis of the system, Rose interviewed all the assemblers in the Melbourne factory. One assembler mentioned that sometimes RoboCut would reject a good piece of timber.
Rose investigates this and finds that the problem started after the last software upgrade six months ago. She contacts MyCut and it claims that none of its other users have reported this problem. After some argument MyCut agrees to send Rose the algorithms related to the

software changes. She finds one algorithm that has to do with the cutting process. RoboCut uses this algorithm to check whether or not a piece of timber is long enough to use.

```
Function Check_Length(Timber_Length, LengthRequired)
Begin
    If Timber_Length > Length_Required Then
        Return true
    Else
        Return false
    End if
End
```

Rose decides to test this algorithm by choosing a length of timber (Timber_Length) of 2.4 metres. For the other variable (Length_Required) she chooses the values 2.3, 2.4 and 2.5.
a. Explain why Rose selected these values.

They are boundary conditions to test the behaviour near, on, and beyond the critical point where the behaviour of the algorithm should change. Most subtle (and hard-to-find) errors tend to occur right at the point where behaviours should change, so test data should focus on that transition point.

3 marks

b. Complete the following table showing what the algorithm should return and what it actually returns.

LengthRequired	What should be returned	What is actually returned
2.3 metres	false	false
2.4 metres	true	false
2.5 metres	true	true

2 marks

c. Explain why RoboCut only sometimes rejects a good piece of timber.

It only accepts pieces **longer** than the length required, and rejects pieces are exactly **equal to** the length required.

1 mark

d. State one alteration to the algorithm that would correct this error.

> should be changed to >=

1 mark

Hmm. A pretty basic > vs >= scenario. Not too imaginative.

Question 8

Rose recommended changes to the system's hardware and hoped to keep the software unchanged. However she now realises that there is a software fault that must also be corrected. MyCut is reluctant to believe that its software has a fault. Rose contacts some of her friends in the software industry and finds one who says he can provide her with the source code for the MyCut software. This will allow her to make her own changes to the program and correct the fault herself.
Discuss the ethical and/or legal issues faced by Rose in this situation.

Ethically, she should want to do everything she could to do what she was hired to do - fix the company's IT problem. This is even more understandable considering the difficult and obstructive attitude of the software company when Rose's request is reasonable.

Legally speaking, using or modifying the software without permission would contravene the Copyright Act 1968.

4 marks

Be sure to name relevant laws accurately. Vague references to actions "being illegal" is not as convincing.

Question 9

The new system requires a significant hardware purchase by Truss-Tee of a large format scanner for each of its factories. Two suppliers have been identified that can provide scanners with the right technical specifications for Truss-Tee at a comparable price of about $ 13,000 each. To help Truss-Tee choose between the two suppliers, identify two other factors that are important for Truss-Tee to consider and explain why these factors are important for Truss-Tee.

Possibilities include:

- Reliability > Is it likely to break down soon? Does the software crash?
- Support > Does the manufacturer offer reasonable warranty and repair conditions? Does it actively upgrade firmware?
- Functionality > Does the equipment have features required by the buyer (e.g. OCR)? Is its maximum resolution adequate?
- Usability > Is it easy and efficient to use? Can it be customised to suit users' preferences?
- Accuracy > Does it produce quality output?
- Performance > How long does it take to perform a scan?

4 marks

I did include hardware/technical compatibility issues at first, but as Adrian Janson pointed out, the question did say that the scanners had the right technical specs for Truss-Tee.

Question 10

Rose believes that Truss-Tee should use a pilot changeover method to the new system. She suggests to Shaun that the Melbourne factory should be the first to change. Shaun realises that for the new system that Rose has proposed, a pilot changeover will not work.

a. Identify the feature of the new system that makes a pilot changeover inappropriate.

The unconverted branches' old hardware would not be compatible with the pilot branch (particularly relating to transmission speeds).

Also, the other branches would not be able to send plans to Melbourne because they don't have scanners.

1 mark

b. Explain why this feature makes a pilot changeover inappropriate.

Other branches would not be able to receive plans with the Melbourne branch within a working day.

Other branches would not be able to send plans to Melbourne because they don't have scanners.

1 mark

c. Recommend and justify a changeover method that Truss-Tee could use.

For them to work as a team, all branches would need to convert directly and simultaneously to the new system. It could not be phased in within a branch because all parts of the new system are required for it to work.

2 marks

Question 11

Now that Truss-Tee has upgraded its computer network it needs to improve its network security to ensure the protection of its information. For each type of protection solution listed below, provide an example and explain how it provides protection for Truss-Tee's information.

Software solution

- network login and password (or biometric ID) > stops unauthorised people accessing workstations

- firewall > protects the LANs against unauthorised external access.

- virus/malware scanner > guards against viruses, worms, trojans, adware, spyware that could damage or steal data or information or misuse their system to send spam or DDOS attacks.

- encryption > to make their files unreadable to unauthorised people, and to protect it during transmission (e.g. PGP)

- backups > to recover data after it has been damaged or lost

Physical solution

- lock branch doors, bar their windows > prevent access by thieves or vandals

- fire alarms, extinguishers > detect & fight fires

- swipe cards > to control who uses which doors and when

- UPS for the server > protect it from power surges, brownouts and blackouts

- put the server in an airconditioned room > protect the server against damaging heat and humidity

- make the server room locked with a restricted key > prevent unauthorised access to the vulnerable server, even by unauthorised employees

- burglar sensors & alarms, surveillance cameras > detects breakins

- lock workstations down to desks > physically deter attempts to pick up and steal equipment and their data

(1 +2) + (l +2) = 6 marks

Question 12

Truss-Tee is establishing the evaluation criteria for the new system. The main system goal is to efficiently and effectively share the design workload between all the sites. In order to measure the success of this it has determined a number of criteria that must be met.

Criterion 1
To ensure that the processing of plans takes no longer than it used to whether the work is done on-site or interstate.

Criterion 2
To ensure the reliability of the system is maintained now that fewer staff will be handling the design process.

The table below outlines the evaluation strategy Truss-Tee has put in place to measure one of these criteria. Complete the table to outline a strategy they could use to evaluate the second criterion.

Evaluation strategy	**Criterion 1: Processing of plans takes no longer than it used to**	**Criterion 2: Reliability of the system is maintained**
Time frame	3-6 months after implementation	3 months after the 2 designers in Melbourne retire. *Their imminent departure was the trigger that got the manager to act in the first place. The new system should only be evaluated after the effects of their departure can be observed.*
Data to be collected and from where	Quote dates from PC1 Job logs from designers Cutting start dates from assemblers Historical data from previous system	Number of jobs that could not be handed in each branch (number of plans sent to another branch) Number of jobs that were not finished in a reasonable time after being handpassed to another branch (dates of sending plans compared with dates the cutting data were returned from the other branch) Customer complaints about inaccurate cuts caused by design errors (phone logs, email logs) Amount of time designers were idle or working overtime (workstation software

		usage logs) Historical data from previous system
How the data will be used to evaluate the criteria and the overall goal	Data about when quotes are generated will give a start date for the process. The job logs will determine when the designers process the plans and the cutting start dates will determine when the job was finalised. This data can be compared against historical data related to job times to ensure that the new system meets this criterion. This assists in demonstrating that the goal of efficiently sharing the design workload is achieved.	The number of handpassed jobs will act as a yardstick to indicate how heavily the system is being used and what workload it's under. If plans are regularly sent, it means the system has been required and is useful. If jobs are not finished on time after being handpassed, and the delay is not caused by communication delays, it means jobs are not properly attended to at the destination branch. Customer complaints about cutting quality indicates errors being made during design that need to be diagnosed. Designer idle time and overtime indicates how well the load sharing is working. If some branches are overloaded and some underloaded, the sharing plan needs to be revised. Historical data lets the new system be compared with the previous system to help isolate the causes of inefficiences or ineffectiveness.

5 marks

With complex and potentially vague questions, I always endorse the practice of providing an example of what is required so kids aren't left playing the "What the hell does the examiner want from me?" game rather than demonstrating their understanding. Good examiner.

On the other hand, I found this question just plain dull and tedious!

Total 49 marks

END OF QUESTION AND ANSWER BOOK

On the whole, a good paper. Unusually for SD, it got one Dog's Breakfast award and a couple of slaps on the tail for being bad.

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